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(54) RECORDING MEDIUMRECORDING METHODRECORDING DEVICEREPRODUCING METHOD AND REPRODUCING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a recording medium capable of effectively utilizing a recording area when new data is additionally recorded in the recording area and of exactly performing the continuous reproduction of former data and new data.
SOLUTION: Concerning this recording mediumin the case of recording one piece of information for each error correction block unitlinking position 52 and information on sink timing is performed (w4 of HYPERLINK "JP-A-2000-843.files/000013.gif" ▪ ▪ drawing 11 (b))d at a specified position in the error correction block. Each error correction block is composed of the prescribed number of sectorseach sector is composed of the prescribed number of sync frames and the linking position information is recorded in the data area near the head position of the specified sync frame in the specified sector.

CLAIMS

[Claim(s)]
[Claim 1]When recording information on 1 for every error correction block unitit is the recording medium which provided a linking position which shows a head of additional recording in a specific position in said error correction blockA recording mediumwherein said each error correction block comprises a sector of a predetermined numbersaid each sector comprises a sink frame of a predetermined number and said linking position is provided in a data area near the head position of said specific sink frame in said specific sector.
[Claim 2]When recording information on 1 for every error correction block unitit is the recording medium which provided a linking position which shows a head of additional recording in a specific position in said error correction blockA recording mediumwherein said each error correction block comprises a sector of 16said each sector comprises a sink frame of 26 and said linking position is established in a data area just behind a sink code of the 3rd sink frame in the 1st sector.
[Claim 3]When recording information on 1 for every error correction block unitit is the recording medium which provided a linking position which shows a head of additional recording in a specific position in said error correction blockSaid each error correction block comprises a sector of 16said each sector comprises a sink frame of 26and said linking position is in a data area just behind a sink code of the 3rd sink frame in the 1st sector.
And a recording medium providing in from a head byte of said data area before 10 bytes.

[Claim 4]When carrying out additional recording of the information on 1 for every error correction block unitit is a record method which provides a linking position which shows a head of additional recording in a specific position in said error correction block of a recording mediumThe 1st step that detects a specific sector in an error correction block of information on 1 which is going to carry out additional recording on said recording mediumThe 2nd step that detects a specific sink frame from two or more sink frames which constitute said specific sectorA record method having the 3rd step that carries out additional recording of the new information on 1 by making into a linking position a head byte of a data area in said specific sink frame detected at said 2nd step.
[Claim 5]When recording information on 1 for every error correction block unitit is a recorder which provides a linking position which shows a head of additional recording in a specific position in said error correction block of a recording mediumThe 1st detection means that detects a specific sector in an error correction block of information on 1 which is going to carry out additional recording on said recording mediumThe 2nd detection means that

detects a specific sink frame from two or more sink frames which constitute said specific sectorA recorder having a recording device which carries out additional recording of the new information on 1 by making into a linking position a head byte of a data area in said specific sink frame detected by said 2nd detection means.
[Claim 6]A step which reproduces an information signal of an error correction block which consists of two or more sectors from a recording mediumA regeneration method having a step which generates timing equivalent to a linking position within said error correction blockand a step which optimizes a reproduced information signal of before and behind said linking position or the back based on said timing.
[Claim 7]A reproduction means which reproduces an information signal of an error correction block which consists of two or more sectors from a recording mediumPlayback equipment having a timing generation means which generates timing equivalent to a linking position within said error correction blockand an optimizing means which optimizes a reproduced information signal of before and behind said linking position or the back based on said timing.
[Claim 8]The regeneration method according to claim 6 providing a step which distinguishes a kind of recording mediumand a step which controls said optimization according to a discriminated result of a kind of said recording medium.
[Claim 9]The playback equipment according to claim 7 establishing a discriminating means which distinguishes a kind of recording mediumand a control means which controls said optimization according to a discriminated result of a kind of said recording medium.
[Claim 10]Slice level for control of said optimization to binary-ize the response characteristic of a PLL circuit of said reproduced information signaland a regenerative RF signalThe response characteristic of an AGC (automatic gain control) circuit for performing gain control of a regenerative RF signalThe regeneration method according to claim 6 or 8 providing a step which performs at least one of control of the equalizing characteristic of an equalizer (EQ) for adjusting the frequency characteristic of a regenerative RF signaland a driving output of a servo system of a window of a hold and a sink signal.
[Claim 11]An optimizing means which controls said optimization The response characteristic of a PLL circuit of said reproduced information signalThe response characteristic of an AGC (automatic gain control) circuit for performing slice level for binary-izing a regenerative RF signaland gain control of a regenerative RF signalThe playback equipment according to claim 7 or 9 controlling at least one of control of the equalizing characteristic of an equalizer (EQ) for adjusting the frequency characteristic of a regenerative

RF signaland a driving output of a servo system of a window of a hold and a sink signal.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]. This invention has DVD-ROM and compatibility and the recordable number of times is represented by DVD-RW (DVD-RW rewritable) with 1000 possible times or more. It belongs to the recording medium which can carry out additional recording of the new record information succeeding the old recorded information currently beforehand recorded on information recording mediasuch as a high density optical diska record methoda recordera regeneration methodand playback equipment.
[0002]
[Description of the Prior Art]In information recording mediasuch as DVD-RW in which 1000 times or more are generally possible with DVD-ROM and compatibility as for the recordable number of timesWhen it is going to overwrite new record information later to the field to which the old recorded information was recordedin order that there may be no linking area for a bondin the linking position of the old recorded information and new record informationa gap occursand since it is discontinuousit can read to frequency or phase relation.
[0003]Thenin the Information Storage Division method for carrying out additional recording of the new record information to this kind of recorded type information recording mediumand a devicewhen recording new record information succeeding the old recorded information. The successive formation field corresponding to the amount of information which is equivalent to error correction unitssuch as an ECC (Error CorrectingCode) block in the error correction processing used in the old recorded information concerned or new record informationin the successive formation part of the old recorded information and new record information is provided conventionallyRecording meaningless dummy information or predetermined RF (Radio Frequency) signal on the portion of the last of the old recorded information and the portion of the beginning of new record information equivalent to this successive formation fieldfor exampleand carrying out the recording start of the original above-mentioned new record information to them after that was performed. 1 ECC block described above here comprises 16 sectors.
[0004]If a successive formation portion is not provided when the Reason for providing this successive formation portion reproduces continuously the new record information and the old recorded information which were recorded

laterIt is because each RF signal may become discontinuous by the boundary part of the record section of the old recorded informationand the record section of new record information and the focus servo and tracking servo at the time of reproduction become a cause which becomes unstable in that case.
[0005]As for the Reason for recording the dummy information etc. which provide the successive formation portion for 1 ECC blockand do not have a meaning therein the conventional error correction processingan error correction is performed for every above-mentioned error correction unit.
When reproducing the old recorded information and the new record information concerned in succession after recording new record information if new record information is recorded from the middle of the error correction unit concernedIt is because an error correction will not be performed correctlytherefore exact continuous reproduction can be performed about the head part of the new record information in an error correction unit.
If it decides beforehand that the dummy information or the predetermined RF signal which is meaningless in a successive formation field as mentioned above is recorded by 1 ECC block at this pointSince the information currently recorded on the portion is meaningless dummy information or predetermined RF signal even if both sides are destroyedwhen the old recorded information and new record information lap in the above-mentioned successive formation part even ifBy skipping without reproducing this portion and reproducing new record information from the next ECC block of the successive formation part concernedreproduction of the old recorded information and new record information can be performed.
[0006]If new record information is recorded succeeding the old recorded informationwithout providing a successive formation fieldboth sides may be destroyed in the portion with which the old recorded information and new record information overlappedbut other Reasons for providing the above-mentioned successive formation field. It is because the destroyed recorded information may be unable to be restored when the range of the destruction in that case exceeds an error correction unit. The thing of the description is proposed by JPH9-270171A as a proposal which solves this problem. Since it has the conventional error correction unitfor examplethe capacity of about 32 kByteand this field will be filled with information unrelated to playbackin the above-mentioned high-density disk etc. which need to record a lot of informationthis proposal is non-efficiency very much.
Can carry out additional recording of the new record information to the problem that the record section on an information recording medium cannot be used effectivelyutilizing the record section of an information recording medium effectivelyand. It was providing the Information Storage Division method and device which can perform correctly continuous reproduction of the

old recorded information and new record information.

[0007]
[Problem(s) to be Solved by the Invention]Howeverin the conventional linking method mentioned aboveit is determined that a linking portion is located near the rear end part of a specific data part among the data by which division recording is carried out into the error correction unit. For this reasonon the occasion of reproductionin the linking portionas a result of the discontinuity of regenerative data arisingfrequency and a phase shift had occurred in regenerative data. Thenin order to cancel this gapthe playback equipment side starts conduct PLLbut necessary time is required in order to return to the state of the origin which does not have this gap. Thereforesince the data reproduced in the conventional linking method in a period after frequency and a phase shift arise in regenerative data by generating of linking until this gap is solved could not be reproducedthe data volume for which such reproduction is improper was size. In the composition (data configuration in each sector which constitutes 1 ECC block shown in drawing 4 (B)) of the error correction unit which specifically consists of the column and row of data volume about 32kByte (byte)for exampleThe above mentioned linking position is near the data area rear end part of the second sink frame H1 (inside of PI)and since new data is linked following old data before and after this positiondiscontinuity has arisen to old and new data. The error correction of the data using PI described above by the data unit for two sink frames is performed. As a resultat the time of reproductionthe frequency and the phase shift of new data to the frequency and the phase of old data occur at the joint of this old and new data. The playback equipment side starts conduct PLL so that this gap may be canceledbut necessary time is required by the time the frequency and the phase of old and new data gather (for exampletime to reproduce the data for two sink frames). For this reasonin that regenerative datafrequency and a phase shift will still occur also in the case of reproduction of the next horizontal single tier (the third sink frame H2the fourth sink frame H3) of the second sink frame H1. Such frequency and phase shift are canceled in the case of reproduction after the fifth sink frame H3. Thereforethere was a problem that the data (the first sink frame H0 - the fourth sink frame H3) of total 2 row and the data for a total of four sink frames became unreproducible.
[0008]Thenthe composition of an error correction unit which accomplished this invention in light of the above-mentioned problemsand carried out (1) aboveLike the data configuration in each sector which constitutes 1 ECC block shown in drawing 5 mentioned laterMaking the data for two sink frames into a horizontal partyas a result of the discontinuity of this point that recognizes

line existenceand the data produced in (2) linking portionsthe data which frequency and a phase shift continue is accomplished paying attention to the point which is a period for abbreviated 2 sink framesand is a thing.
If a linking portion is located near the tip part of the data for two sink frames (namelydata area near the tip part of the sink frame of the beginning of the 2 sync frame units)the purposeAfter the progress during a regeneration phase for these two sink frames. Can obtain regenerative data without frequency or a phase shiftand by the ability to reduce the quantity of unreproducible data by half as a result as compared with the above mentioned formerAdditional recording of the new record information can be carried outmaking such an error amount into the minimum and utilizing the record section of a recording medium effectivelyand it is providing the recording medium which can perform correctly continuous reproduction of the old recorded information and new record informationa record methodand a recorder.
Although the change portions of record and record are connectable in a linking positionIn the linking sector portion in an ECC blocksince some data is destroyedeven though there is little probability that a correction impossible error will occur in an error correctiona data error may generate it too.
[0009]This invention aims at offer of the recording medium and record method which are made in view of above-mentioned SUBJECTprevent generating of the data error at the time of reproductionand enable stable reproduction and a devicea regeneration methodand a device.
[0010]
[Means for Solving the Problem]In order to solve SUBJECT mentioned abovethis invention provides a recording mediuma record methoda recordera regeneration methodand playback equipment which are shown below.
(1) When recording information on 1 for every error correction block unitit is the recording medium which provided a linking position which shows a head of additional recording in a specific position in said error correction blockA recording mediumwherein said each error correction block comprises a sector of a predetermined numbersaid each sector comprises a sink frame of a predetermined number and said linking position is provided in a data area near the head position of said specific sink frame in said specific sector.
(2) When recording information on 1 for every error correction block unitit is the recording medium which provided a linking position which shows a head of additional recording in a specific position in said error correction blockA recording mediumwherein said each error correction block comprises a sector of 16said each sector comprises a sink frame of 26 and said linking position is established in a data area just behind a sink code of the 3rd sink frame in the 1st sector.
(3) When recording information on 1 for every error correction block unitit is

the recording medium which provided a linking position which shows a head of additional recording in a specific position in said error correction blockSaid each error correction block comprises a sector of 16and said each sectorA recording medium which comprises a sink frame of 26and said linking position is in a data area just behind a sink code of the 3rd sink frame in the 1st sectorand is characterized by being provided in from a head byte of said data area before 10 bytes.

(4) When carrying out additional recording of the information on 1 for every error correction block unitit is a record method which provides a linking position which shows a head of additional recording in a specific position in said error correction block of a recording mediumThe 1st step that detects a specific sector in an error correction block of information on 1 which is going to carry out additional recording on said recording mediumThe 2nd step that detects a specific sink frame from two or more sink frames which constitute said specific sectorA record method having the 3rd step that carries out additional recording of the new information on 1 by making into a linking position a head byte of a data area in said specific sink frame detected at said 2nd step.

(5) When recording information on 1 for every error correction block unitit is a recorder which provides a linking position which shows a head of additional recording in a specific position in said error correction block of a recording mediumThe 1st detection means that detects a specific sector in an error correction block of information on 1 which is going to carry out additional recording on said recording mediumThe 2nd detection means that detects a specific sink frame from two or more sink frames which constitute said specific sectorA recorder having a recording device which carries out additional recording of the new information on 1 by making into a linking position a head byte of a data area in said specific sink frame detected by said 2nd detection means.

(6) A step which reproduces an information signal of an error correction block which consists of two or more sectors from a recording mediumA regeneration method having a step which generates timing equivalent to a linking position within said error correction blockand a step which optimizes a reproduced information signal of before and behind said linking position or the back based on said timing.

(7) A reproduction means which reproduces an information signal of an error correction block which consists of two or more sectors from a recording mediumPlayback equipment having a timing generation means which generates timing equivalent to a linking position within said error correction blockand an optimizing means which optimizes a reproduced information signal of before and behind said linking position or the back based on said timing.

[0011]
[A mode of implementation of an invention] Nexta gestalt of a recording medium of this inventiona record methodand a recorder is explained. When a recording medium of this invention records information on 1 for every error correction block unitAre a linking position which shows a head of additional recording the recording medium formed in a specific position in said error correction blockand said each error correction blockIt comprises a sector of a predetermined numbersaid each sector comprises a sink frame of a predetermined numberand said linking position is a recording medium providing in a data area near the head position of said specific sink frame in said specific sector.
[0012]When a recording medium of this invention records information on 1 for every error correction block unitAre a linking position which shows a head of additional recording the recording medium formed in a specific position in said error correction blockand said each error correction blockIt comprises a sector of 16said each sector comprises a sink frame of 26and said linking position is a recording medium providing in a data area just behind a sink code of the 3rd sink frame in the 1st sector.
[0013]When a recording medium of this invention records information on 1 for every error correction block unitAre a linking position which shows a head of additional recording the recording medium formed in a specific position in said error correction blockand said each error correction blockComprise a sector of 16 and said each sectorComprising a sink frame of 26it is in a data area just behind a sink code of the 3rd sink frame in the 1st sectorand said linking position is a recording medium providing in from a head byte of said data area before 10 bytes.
[0014]When a record method of this invention carries out additional recording of the information on 1 for every error correction block unitIt is a record method which provides a linking position which shows a head of additional recording in a specific position in said error correction block of a recording mediumThe 1st step that detects a specific sector in an error correction block of information on 1 which is going to carry out additional recording on said recording mediumThe 2nd step that detects a specific sink frame from two or more sink frames which constitute said specific sectorIt is a record method having the 3rd step that carries out additional recording of the new information on 1 by making into a linking position a head byte of a data area in said specific sink frame detected at said 2nd step.
[0015]When a recorder of this invention records information on 1 for every error correction block unitIt is a recorder which provides a linking position which shows a head of additional recording in a specific position in said error correction block of a recording mediumThe 1st detection means that detects a specific sector in an error correction block of information on 1

which is going to carry out additional recording on said recording mediumThe 2nd detection means that detects a specific sink frame from two or more sink frames which constitute said specific sectorIt is a recorder having a recording device which carries out additional recording of the new information on 1 by making into a linking position a head byte of a data area in said specific sink frame detected by said 2nd detection means.

[0016]A recording medium of this invention performs predetermined signal processing to recorded information beforehand divided for every unit of a row of an error correction set up beforehandand a columnIt is a recording mediumwherein it is an information recording medium which memorizes processing recorded information which consists of two or more record units and a position which carries out postscript record is a head position of a row of said error correction.

[0017]A recording medium of this invention is a recording medium which carries out that it is the structure where recorded information is arranged and a position which carries out postscript record is a position just behind control informationsuch as a sink code of a row of said error correctionto a row of said error correction set up beforehand with the feature after control informationsuch as a sink code.

[0018]A record method of this invention performs predetermined signal processing to recorded information beforehand divided for every unit of a row of an error correction set up beforehandand a columnIt is a record methodwherein it generates processing recorded information which consists of two or more record unitsand is the Information Storage Division method which records the processing recorded information concerned on an information recording mediumit generates said processing recorded information and a position which carries out postscript record makes it said information recording medium with a position immediately after a row of said error correction.

[0019]To a row of said error correction set up beforehanda record method of this invention after control informationsuch as a sink codeIt is the structure where recorded information is arranged and is a record method making a position which carries out postscript record an information recording medium with a position just behind control informationsuch as a sink code of a row of said error correction.

[0020]A means by which a recorder of this invention performs predetermined signal processing to recorded information beforehand divided for every unit of a row of an error correction set up beforehandand a columnThey are a means to generate processing recorded information which consists of two or more record unitsan Information Storage Division means to record the processing recorded information concerned on an information recording mediumand a recorder that

carries out consisting of a postscript recording device which a position which carries out postscript record makes a position immediately after a row of said error correction to said information recording medium with the feature.
[0021]To a row of said error correction set up beforehanda recorder of this invention after control informationsuch as a sink codeIt is the structure where recorded information is arranged and is a recorder becoming said information recording medium from a position postscript recording device just behind control informationsuch as a sink code of a row of said error correctionabout a position which carries out postscript record.
[0022]Nexta suitable embodiment of a recording medium of this inventiona record methodand a recorder is described based on Drawings. Although following embodiments describe an embodiment which applied this invention to the Information Storage Division device for recording information to DVD-RWeven if it uses recording mediasuch as CD-R in which other additional recording is possibleCD-RWand DVD+RWit cannot be overemphasized that this invention is applicable.
[0023]Below "an embodiment of a recording format" describes first "an embodiment of a recording format" used for this invention. Error correction processing in a general physical format and the recorded information concerned at the time of recording recorded information on introduction and DVD-RW is explained using drawing 1drawing 2and drawing 3.
[0024]Firstan ECC block as an error correction unit in error correction processing in DVD-RW and the error correction processing concerned of this embodiment is explained using drawing 1.
[0025]Generallyrecorded information recorded on DVD-RW constitutes the physical structure containing two or more data sectors 20 shown in drawing 1 (A)and is constituted. And ID information 21 which shows a starting position of the data sector 20 from the head in the data sector 20 of 1The ID information error correcting code (IED) 22 for correcting an error of ID information 21 concernedThe preliminary data (for exampleCPM) 23 and the data area 24 which stores main data which should be recordedIt is constituted by the error detection code (EDC) 25 for detecting an error in the data area 24and recorded information which should be recorded when two or more these data sectors 20 continue is constituted.
[0026]Nextprocessing at the time of constituting an ECC block using this data sector 20 is explained using drawing 1 (B). When an ECC block is constituted using the data sector 20as shown in drawing 1 (B)firstthe data sector 20 of 1 is divided every 172 bytes horizontallyand each divided data (this is hereafter called data block 33.) is arranged in perpendicularly. Perpendicularly at this timethe data block 33 of 12 lines will be located in a line.

[0027]And 10 bytes of ECC inner code (PI (Pality In) numerals) 31 is added to the last of the data block 33 concerned to each data block 33 of width arranged perpendicularlyand the correction block 34 of 1 is constituted. In this stagethe correction block 34 of 12 lines with which the ECC inner code 31 was added will be perpendicularly located in a line. Thenthis processing is repeated only for data sector 20 minutes of 16. Therebythe correction block 34 of 192 lines is acquired.
[0028]Nextin the state where it was arranged perpendicularlyshortlythe above-mentioned correction block 34 of 192 lines divides the correction block 34 concerned of 192 lines perpendicularly from the beginning for every byteand adds the numerals 32 outside [ECC] 16 pieces (PO (Pality Out) numerals) to each divided data. The numerals 32 outside the ECC concerned are added also to a portion of the ECC inner code 31 among the above-mentioned correction blocks 34.
[0029]It is formed as ECC block 30 of 1 containing the data sector 20 of 16 shows drawing 1 (B) by the above processing. At this timea total amount of information included in ECC block 30 of 1 will be byte (172+10) x (192+16) line =37856 byteamong these data recorded in the actual data area 24 will be 2048 bytes x 16= 32768 bytes.
[0030]In ECC block 30 shown in drawing 1 (B)D#.*shows 1 byte of data. For exampleD1.0shows 1 byte of data arranged at the 0th row per line [the]and "D190.170" shows 1 byte of data arranged at the 170th row of the 190th line. Thereforethe ECC inner code 31 will be arranged at the 172nd row thru/or the 181st rowand the numerals 32 outside ECC will be arranged at the 192nd line thru/or the 207th line.
[0031]The correction block 34 of 1 is continuously recorded on DVD-RW. Constituting ECC block 30 here so that both sides of the ECC inner code 31 and the numerals 32 outside ECC may be included as shown in drawing 1 (B)It is for correcting data located in a line in the direction of width (level) in drawing 1 (B) with the ECC inner code 31and correcting data located in a line in the direction of length (vertical) in drawing 1 (B) with the numerals 32 outside ECC. [namely/ in ECC block 30 shown by drawing 1 (B)]It becomes possible to carry out an error correction to a duplex of the direction of width (level)and the direction of length (vertical)and it is constituted so that an error correction can be more powerfully done as compared with error correction processing used for the conventional CD (Compact Disk) etc.
[0032]It is more specifically about this point the correction block 34 (as mentioned above) of 1for example. It is continuously recorded on DVD-RW including a total of 182 bytes of data including the ECC inner code 31 for a party. If it is to 5 byteseven if a crack etc. breakcan correctbut. if all one rows carry out by a crack of DVD-RWetc. having broken at 6 bytes or moreit

cannot correct in the ECC inner code 31 -- it becomes. Howevereven if it uses if all one rows carry out by a crack etc. having brokenwhen it is seen from a perpendicular directionit is 1 byte of only data corruption to the numerals 32 outside [ECC] one row. Thereforeif an error correction is performed using the numerals 32 outside ECC of each sequenceeven if all the correction blocks 34 of 1 are destroyedan error correction can be performed correctly and it can reproduce correctly. Howeverif generating of an acquired cracketc. are taken into considerationif a crack of a row (level) becomes largesince it will lead also to an error of a row (level) of the next perpendicular directionit cannot be overemphasized that it stops to the minimum. Incidentallyeven if it is about an error of this lengthwise direction eight rows (they are 16 rows by IRE jar correction) wideit can correct.

[0033]Nextthe data sector 20 constituted by ECC block 30 shown by drawing 1 (B) explains using drawing 2 how it is concretely recorded on DVD-RW. In drawing 2data shown by "D#.*" is equivalent to data described in drawing 1 (B). When recording ECC block 30 on DVD-RWas shown in drawing 2 (A)when ECC block 30 is horizontally put in order and interleaved by single tier every correction block 34it is first divided into the recording sector 40 of 16. At this timethe recording sector 40 of 1 will include 2366 bytes (37856byte/16) of informationand the data sector 20the ECC inner code 31or the numerals 32 outside ECC are intermingled in this. Howeverin a head of each recording sector 40ID information 21 (refer to drawing 1 (A)) in the data sector 20 is arranged.

[0034]And as the recording sector 40 of 1 is shown in drawing 2 (B) and (C)it is divided into the data 41 in every 91 bytesand the sink H is added to each. Thenthe sink frame 42 of 1 is formed each data 41 of every by modulating the recording sector 40 of this state eight to 16 times. At this timethe sink frame 42 of 1 is constituted by sink H' and the data 43as shown in drawing 2 (D). The amount of information in the sink frame 42 of 1 will be 91 byte x8x(16/8) =1456 byteand information is written in a DVD-RW disk with a gestalt which this sink frame 42 followed. At this timethe recording sector 40 of 1 will contain the sink frame 42 of 26.

[0035]Drawing 3 explains this collectively. A sector of a head of an ECC block which consists of 16 physical sectors is constituted like drawing 3. That isa row becomes 172 bytes of data from 186 bytes at 10 bytes of Pland 4 bytes of a sinkand consists of 13 lines which added one line of P0 to a column of 12 lines. A sink is 2 bytes of 26 from H0 to H25.

[0036]By constituting a physical format explained above and recording information on a DVD-RW diskSince the amount of data blocks which can restore ECC block 30 of a basis and is destroyed can be made into the minimum if eight to 16 recovery and a DEINTA reeve are performed when reproducing the

information concerned (refer to drawing 2)An error correction powerful as mentioned above can be performedand information can be reproduced most correctly.

[0037]Nextexplanation about a positioni.e.a linking positionwhich carries out postscript record is given using drawing 4 and drawing 5. In drawing 4it is based on an ECC block corresponding to a standard of DVD-R shown in drawing 3. As shown in drawing 4the linking position L is specified as a range between 82-87 bytes from a head of the second sink H1 of a first sector of an ECC block here. That issince this second sink frame sy2 comprises 2 bytes of the second sink H181 bytes of dataand 10 bytes of PI numerals (PI)linking will be performed among the 2-7th byte from a head of this PI. When a clock tends to be generated from changing a phase and frequency of record data by PLL etc. to front data (it shifts) and it is going to establish datait becomes impossible to lock PLL and may stop being able to read data before and after the linking position L.

[0038]10 bytes of data of a before [the 82-91st byte] can be read as this linking position L is the 82nd byte of position from a head of the second sink H1. That issince width of this linking position L is 6 bytes and correcting capability of PI sequence is to 5 bytes as mentioned aboveit becomes impossible correcting this first row (namelyeach data of first and second sink frame sy1 and 2). Nextif PLL will lock the second row (namelyeach data of third and fourth sink frame sy3 and 4) containing a sink of H2 by the time it becomes a sink position of this third sink H2can readbut. When there are change of frequencyetc. in addition to a phasetens of bytes of signal is required for PLL to drawand it becomes impossible to detect the third sink H2. As a resultdata in the second row will not be able to be establishedbut this sequence will also be correction impossible.

[0039]Since correction is possible by PO even if eight rows of PI sequences break as mentioned aboveread-out of data is eventually possible. Howeverthat there is an error of two rows potentially has the problem that it is weakto an increase in an error of an acquired factor.

[0040]On the other handdrawing 5 shows specificationssuch as DVD-RW which is an example of a recording medium of this invention. Herethe linking position L is specified as a range between 1-3 bytes from a head of a data area just behind the third sink H2 of a first sector of an ECC block. Namelywidth of this linking position L is 3 bytes (half in the case of the drawing 4)and this third sink frame sy3Since it comprises 2 bytes of the third sink H281 bytes of dataand 10 bytes of PIeven the 1-3rd byte will be used from a head of a data area of this third sink frame sy3and linking will be performed. This linking position L has started an initial-data position (from a head of a data area to the 3rd byte) of a data area of third sink frame sy3.

[0041]When a clock tends to be generated from changing a phase and frequency of record data by PLL etc. to front data (it shifts) and it is going to establish datait becomes impossible to lock PLL and may stop being able to read data before and after this linking position L. 89 bytes of data of a before [the 2-91st byte] can be read as this linking position L is a position from a head of a data area just behind the third sink H3 to the 2nd byte temporarily. As mentioned abovesince correcting capability of PI sequence is to 5 bytesit becomes impossible correcting this second row (namelyeach data of third and fourth sink frame sy3 and 4). Howevereven if it is the worst conditions in between until it becomes the timing of the third following row (namelyeach data of fifth and sixth sink frame sy5 and 6)it is enough for PLL to drawand as a resulta sink of the fourth sink H4 can be detected. As a resultalthough data of the second row is unestablishableonly this second row becomes error correction impossibleand although shown in the drawing 4it is beforehand avoidable that two rowsthe first and the second rowbecome error correction impossibleand data is destroyed like. That isquantity by which data as an PI sequence is destroyed can be set to one half.
[0042]Although it explained that the linking position L was formed in the 3rd byte from a head of a data area of third sink frame sy3In addition(1) linking position L is established using 3 bytes of a before [from a head of a data area of third sink frame sy3 / the 10th byte]or. (2) The linking position L is formed in the 3rd byte from a head of a data area of first sink frame sylor(3) As for the linking position Lit is needless to say that it may be made to be provided using 3 bytes of a before [from a head of a data area of first sink frame sy3 / the 10th byte].
[0043]A physical format which has "the embodiment of a recording format" described using "an embodiment of the Information Storage Division device" next drawing 123 and 4and drawing 5 explains an embodiment of a recorder concerning this invention for recording information on DVD-RW using drawing 6. Prepit which recorded address information on the DVD-RW concernedetc. in DVD-RW in following embodimentsIt shall be beforehand formed in code track superiors which should record recorded informationaddress information on DVD-RW shall be obtained by detecting the prepit concerned beforehand at the time of record of recorded informationand a recording position on DVD-RW which records recorded information by this shall be detected and recorded.
[0044]It explains in detailreferring to Drawings for a desirable embodiment of a recording medium concerning this inventiona record methodand a recorder hereafter. Firstcomposition of a recorder concerning this invention is explained using drawing 6.
[0045]Outline composition of an optical disk unit as 1 embodiment with which a recording medium concerning this inventiona record methodand a device are

applied is shown in drawing 6. In an embodiment of the inventionMPEG 2 is adopted as compression extension artand DVD-RW rewritable as an example of an optical disc is mentioned. In composition of drawing 6it is omitting about many portions usually provided in what is called a DVD device etc.
[0046]In this drawing 6the optical disc 1 is a recorded type optical disc which consists of phase change materialsfor exampleand what is called a DVD-RW disk is used for it by this embodimentfor example. A DVD-RW disk constitutes 1 block from 16 sectors which a sector (track) is spirally allotted within a diskand rotation is controlled by a constant linear velocity (CLV)and continueand is made with a batch (ECC block) of this error correction of the above [1 block]. This optical disc 1 is attached to the spindle motor 2 by a chucking mechanism which is not illustrated.
[0047]The spindle motor 2 concerned is rotated with the driver 7and the optical disc 1 in which chucking is carried out by chucking mechanism is rotated. This spindle motor 2 is provided with FG generator and a detection means of rotary position signalssuch as a Hall device. An FG signal from this FG generator and a rotary position signal from a Hall device return to the servo section 8 via the driver 7 as rotation servo signals.
[0048]The optical head 3 uses a semiconductor laser as a light sourceand with a collimating lensan object lensetc. Focusing and tracking of laser spot are performed by forming laser spot on a predetermined track of the optical disc land driving an object lens in a dual shaft actuator. A semiconductor laser is driven by a laser drive circuitand a dual shaft actuator is driven with the driver 7.
[0049]The key input section 10 is provided with two or more keys operated by userand sends key operation input from a user to the system controller 9. That isfrom this key input section 10various kinds of key operation input which directs a recording starta reproduction starta record stopa reproduction stopetc. is made by user as an input is possible.
[0050]The interface part 13 is Interface Division for sending and receiving datafor example between computers etc.for exampleis the so-called interface of ATAPI (ATA Packet Interface).
[0051]The system controller 9 as key operation input from the key input section 10According to various key operation inputsuch as a recording starta reproduction starta record stopand a reproduction stopLSI (the signal processing part 5the servo section 8the amplifier part 4AV coding decoding section 6 grade) of each part of an optical disk unit of this embodiment is controlled. Data is sent and received via the interface part 13. A case where resolution of a picture to recordfor examplea scene with quick speedssuch as a car raceetc. are dividedAlso when control data for setting up by record time priority is inputted from the key input section 10 or the input terminal 12the

control data is recognizedthe record time can be changed based on the recognition resultor an external user enables itas for the system controller 9 concernedto choose the setting out.
[0052]Herewhen playing a signalfor example from the optical disc 1instructions of a playback start are made from the key input section 10and the system controller 9 at this time controls the amplifier part 4the servo section 8and the driver 7 which are mentioned later according to instructions of the playback start concerned. Namelywhen playing a signalfrom the optical disc 1 the system controller 9Rotate the optical disc 1 and it is made to irradiate with laser spot on the optical disc 1 firstAn address signal currently beforehand formed in a signal track on the optical disc 1 concerned is readan object sector (track) which should be played from the address information is foundand the optical head 3 is moved so that laser spot may arrange on the object sector (track). After movement to this object sector is completedsignal regeneration from the object sector concerned is started.
[0053]The amplifier part 4 at the time of playback of the optical disc 1 amplifies an RF signal played from an object sector of the optical disc 1 concerned by the optical head 3and it generates a regenerative signaltrackingand a focusing servo signal (a tracking error and a focus error signal) from this RF signal. The amplifier part 4 concerned is provided with the following.
An equalizer which optimizes the frequency characteristic of a regenerative signal at least.
A PLL (phase locked loop) circuit which a byte clock is extracted from a regenerative signaland generates a speed servo signal.
A jitter generation machine which takes out a jitter component from comparison with a byte clock from this PLL circuitand a time-axis of a regenerative signal.
A jitter value generated by this amplifier part 4 is sent to the system controller 9tracking a focusing servo signaland a speed servo signal are sent to the servo section 8and a regenerative signal is sent to the signal processing part 5.
[0054]The servo section 8 receives a speed servo signal from the amplifier part 4and focusing and a tracking servo signal of the optical head 3and receives a rotation servo signal from the spindle motor 2and performs servo control of a part correspondingrespectively based on these each servo signal. A speed servo signal with which a PLL circuit of the amplifier part 4 generated the servo section 8 according to disk rotational speed when said concretelyBased on a rotation servo signal from the spindle motor 2a revolving speed servo control signal which rotates an optical disc in a predetermined constant linear velocity is generated so that the spindle motor 2 concerned

may be rotated with predetermined revolving speed. Although mentioned later for detailsAt this embodimentit is made to perform record/playback of the optical disc 1 with a recording rate (record data transfer rate)/reproduction speed quicker than a data maximum transfer rate at the time of the compression/extension in an inside (regenerative data transfer rate). Thereforethe servo section 8 generates a revolving speed servo control signal for rotating the optical disc 1 in a constant linear velocity which suits the recording rate/the reproduction speed concerned. The servo section 8 generates focusing and an optical head servo control signal for carrying out tracking correctly [the optical head 3] on the optical disc 1 based on focusing and a tracking servo signal. These revolving speed servo control signal and an optical head servo control signal are sent to the driver 7. A recording rate (record data transfer rate) of the optical disc 1 will be called a recording rate after thisand reproduction speed (regenerative data transfer rate) of the optical disc 1 will be called a reproduction rate.

[0055]The driver 7 operates based on each servo control signal from the servo section 8and rotates the spindle motor 2 according to a revolving speed servo control signal from the servo section 8and he drives a dual shaft actuator of the optical head 3 according to an optical head servo control signal. In this embodimentwhen the driver 7 concerned drives the spindle motor 2 according to a revolving speed servo control signalWhen the optical disc 1 is rotated with predetermined linear velocity and the driver 7 concerned drives a dual shaft actuator of the optical head 3 according to an optical head servo control signalfocusing and tracking of laser spot on an optical disc are performed.

[0056]The signal processing part 5 at the time of playback of the optical disc 1 performs synchronizing detection from a digital signal which carried out A/D (analog/digital) conversion of the regenerative signal supplied from the amplifier part 4and was acquired by this A/D conversionand. Decoding to NRZ (Non Return to Zero) data from what is called an EFM+ signal (8 -16 modulating signal) given to the digital signal concerned is performederror correction processing is performed furtherand address information and regenerative data of a sector on the optical disc 1 are obtained. Address information and a synchronized signal which were obtained in the signal processing part 5 are sent to the system controller 9. Details about error correction processing etc. which are performed in the signal processing part 5 concerned are mentioned later.

[0057]When the regenerative data concerned is the data by which compression encoding was carried out with a variable transfer rate of MPEG herein an optical disk unit of this embodiment. He makes 64 M bytes of D-RAM (track buffer memory 7) memorize the data concerned temporarilyand is trying to absorb a part for a time jitter of a variable transfer rate of that

regenerative data by controlling writing/read-out of this track buffer memory 7. With a track buffer memory used in this embodiment. A buffer memory used at the time of a buffer memory for absorbing a variable transfer rate which shows a thing of a buffer memory which stores compressed data temporarilyfor exampleit generally has in DVDencoding of MPEGor decoding is included. The system controller 9 performs a storage capacity of this track buffer memory 7 and management of a storage areaand writing/reading control via the signal processing part 5.

[0058]AV coding decoding section 6 at the time of playback of the optical disc 1When regenerative data supplied from the track buffer memory 7 is the data which compression encoding was carried outfor example in MPEG 2and audio information and a video data multiplexedThis compressed audio data and compressed video data that were multiplexed are separatedand in MPEG 2extension decryption is carried outD/A (digital/analog) conversion is carried out furtherand each is outputted from the terminal 11 as an audio signal and a video signal. A video signal outputted from this terminal 11 is processed with an NTSC (National Television System Committee) encoder etc. which are not illustratedand is displayed on a monitoring deviceand sound emission of the audio signal is sent and carried out to a loudspeaker etc. which are not illustrated. Speed (a data transfer rate at the time of extension decryption and the following will call it an extension rate) of extension decryption by AV coding decoding section 6 at the time of this reproduction is made with an extension rate according to a recording mode which was set up at the time of record and which is mentioned later. In other wordsAV coding decoding section 6 is made as extension decoding processing according to two or more extension rates is possibleit determines the extension rate concerned according to a recording mode set up at the time of recordand performs extension decryption at the rate. Information on this recording mode is recorded on the optical disc 1 with record data as CDCThe CDC concerned is read at the time of playback of the optical disc 1it is sent to the system controller 9and the system controller 9 sets up an extension rate of AV coding decoding section 6 based on this CDC. D/A conversion can also be carried out in the exterior of the AV coding decoding section 6 concerned.

[0059]It is one sideand in performing signal record to the optical disc 1for exampleinstructions of a recording start are made from the key input section 10and the system controller 9 controls the amplifier part 4the servo section 8and the driver 7 according to the recording start instructions concerned. Namelyin performing signal record of the optical disc 1. Rotate the optical disc 1 and it is made to irradiate with laser spot on the optical disc 1 firstAn address signal currently beforehand formed in a signal track on the optical disc 1 concerned as prepit is readan object sector (track) which

should be recorded from the address information is foundand the optical head 3 is moved so that laser spot may arrange on the object sector (track). Details of an address signal currently beforehand recorded on the optical disc 1 concerned are mentioned later.

[0060]From the terminal 11an audio and a video signal which should be recorded are inputted and these signals are sent to AV coding decoding section 6. At the time of record of the optical disc concernedAV coding decoding section 6The A/D conversion of an audio signal and the video signal is carried outcompression encoding of MPEG 2 is performed at speed according to a recording mode which mentions audio information and a video data laterrespectivelythey are multiplexed furtherand it sends to the signal processing part 5. Hereafterspeed (data transfer rate at the time of compression encoding) of compression encoding in this AV coding decoding section 6 will be called a compression rate. That isAV coding decoding section 6 can perform compression encoding at two or more compression rates which responded to a recording mode.

[0061]16 M bytes of D-RAM8 is a memory for memorizing data temporarily in the case of compression extension in AV coding decoding section 6. This D-RAM8 may have the capacity of 64 M bytes. An A/D conversion can also be carried out in the exterior of the AV coding decoding section 6 concerned.

[0062]The device of this embodiment can also carry out record reproduction of the data of still picture informationa program file on a computeretc. other than an image or speech information. In this casedata of still picture informationa program fileetc. is supplied from the interface part 13and these data is sent to the signal processing part 5 via the system controller 9.

[0063]In the signal processing part 5 at the time of record of the optical disc concerned. To data of a program file through compressed data and the system controller 9 from AV coding decoding section 6etc.an error correction code is addedencoding of NRZ and EFM+ is performeda synchronized signal further supplied from the system controller 9 is addedand record data is generated.

[0064]Hereafter the record data concerned is temporarily memorized by the track buffer memory 7it is read from the track buffer memory 7 concerned at a read-out rate according to a recording rate to the optical disc 1. A storage capacity of the track buffer memory 7 at the time of this record and management of a storage areaand details of writing/reading control are mentioned later. A predetermined modulation process is performed in the signal processing part 5and record data read from this track buffer memory 7 is sent to the amplifier part 3 as a record signaland is recorded on an object sector (track) on the optical disc 1 by the optical head 3.

[0065]The system controller 9 at this time carries out A/D (analog/digital)

conversionand measures a jitter value from the amplifier part 4and a waveform correction amount in the amplifier part 4 at the time of record is changed according to this measurement jitter value and asymmetry value. That iswhen recording a signal on the optical disc 1in the amplifier part 4waveform amendment of the signal from the signal processing part 5 is carried outand this signal that carried out waveform amendment is sent to a laser drive circuit of the optical head 4.

[0066]Nextan address of a data area on the optical disc 1 concerning this invention embodiment is explained below.

[0067]The optical disc 1 of this embodiment is a disk of DVD-RW which has DVD videoDVD AudioDVD-ROMetc. and compatibilityand was based on a standard of DVD. In order to make possible address control at the time of recordan address of a sector is usually beforehand recorded or formed on a disk at not only this DVD-RW but added type of a postscriptor a rewritable optical disc. Howeveralthough address record by carrying out wobbling of the groove according to frequency modulated based on address information is made in an optical disc which exists conventionallyIn DVD-RW of this embodimentin order to enable more nearly high-speed and high-density recordwhat is called a LPP (land prepit) addressing scheme that forms a predetermined pit is also adopted as a land on an optical disc with a wobbling frequency signal of the groove concerned.

[0068]A sector address (it is only hereafter considered as a LPP address) by a LPP address which it is beforehand recorded on the optical disc land is also a timing signal of record here when actually performing Data Recording Sub-Division to the optical disc 1It is common to coincide a sector address (it is hereafter considered as a data address) contained in record data in which record is actually made. A case so that data reproducedfor example from the usual DVD as an example of Data Recording Sub-Division whose LPP address and data address correspond in this way may be recorded on similar DVD-RW can be mentioned. In this caseon a disk of the DVD-RW concernedrecord of data will be made continuouslytherefore relation between a LPP address and a data address can be changed into the state of having been in agreement.

[0069]Nextoperation of postscript record treated in this invention embodiment is explained below. In this embodimentas shown in drawing 7 (A)1 ECC block is constituted from 16 data sectors (32kByte) which a data area followsand this ECC block serves as the minimum basic unit at the time of record or reproduction. Each data sector consists of a sink frame which has 26 sinks recorded synchronizing with an address which comprised LPPand a sink timing signal for record. In DVD-RWan address of a sector is formed at the predetermined intervals.

[0070]Hereas shown in drawing 7 (B)in newly recording data which continued

behind area (data area) recorded before like intermittent recording using the track buffer memory 7 mentioned abovedata in a portion of a knot of the pre-record and post-record becomes discontinuous. Thenin order to make influence of the data discontinuity the smallestas it is shown in drawing 7 (C)it is a heading sector (physical sector.) of an ECC block. The knot position concerned is brought to the 3rd byte from the 1st byte of the 3rd sink frame (3rd sink frame) of the 1st sector. That isit is considered as a linking position for this knot being located in the linking (linking). A heading sector which the 3rd sink frame in which the linking position L concerned exists turns into a linking frameand contains the linking frame concerned serves as a linking sector.

[0071]Thuswhen continuous Data Recording Sub-Division becomes discontinuousin order to avoid influence of the discontinuous part concernedit links in the position. In order that an ECC block newly recorded to an ECC block recorded before may connect continuouslyIn order to make for the 1 to 3rd [of the 3rd sink frame of a heading sector of the ECC block concerned] byte into a linking position and not to lose data by linkingThe over-write [it is made for some data to overlap and] as continuous data to data currently recorded by the 2nd sink frame (2nd sink frame).

[0072]A method of this drawing 7 generates correction attached data (PIPO) of an ECC block beforehand using the track buffer memory 7Thendata is recorded even for 1st2ndand 3rd sink frame sy1 of a next ECC blocksy2and sy3 following a front ECC block on the basis of timing of a sink signal (sink of a graphic display to drawing 7 (A)) of LPPWhen 3 bytes of signal for an over-write [signal / this / 3rd sink] is recordedrecord of data is stopped temporarily. thendata which should be recorded on the track buffer memory 7 -- **when saved in fixed quantityPosition the pickup 3 to said ECC block againand timing of the 3rd sink signal of LPP equivalent to the 3rd sink signal of said ECC block is detectedOverwrite of 3 bytes of signal (linking position L) for [said] an over-write is again carried out on the basis of this timingand it becomes realizable by what carries out continuous recording of the data after this. Since it is required to overlap some data in order to perform the above-mentioned over-writingwhen realizing a method of this drawing 7duplication processing of a data part of that connector will be performed.

[0073]This linking position L is immediately after a LPP sink signal (the 3rd sink signal) which is a recording timing signalFrom record timing being correctly generablethe range of a position of linking can be lessened to the conventional linking methodand accuracy of a gap of phase relation of relation of a signal of order can be improvedand it becomes improvement in performance of a regenerative signal reducible [a loss field by linking].

[0074]Howeverseveral bytes of a linking portion are destroyed by repeating

record also by a method of this drawing 7A problem of it becoming impossible to read about hundreds of bytes from several bytes of a portion of linking by a phase in this record order or discontinuity of frequencywhen the worst between time of stabilization of a PLL circuit of a regenerative circuitetc. occurs.

[0075]Since it is suchare the inside of a lead-in groove field of the optical disc 1for examplea management data field is established in what is called recording management area (RMA)Information which shows the linking position L at the time of record is recorded on this management data fieldBy performing predetermined processing (change of a response characteristic for linkingand change processing of a window) which is later mentioned based on information which shows the linking position L of the management data field concerned at the time of next reproductionData is seldom lost fundamentally but influence of data discontinuity by a knot of record and record is made avoidable. A field where information which shows the linking position L concerned records an address of a starting position of Data Recording Sub-Division among management data fields and end positionor a starting position of Data Recording Sub-Division and an interval during an end is recorded independently. Not the inside of recording management area inside a lead-in groove field of the optical disc 1 but simultaneously with record datainformation which shows the linking position L concerned can be recorded on data recording regions as one of the CDCsfor example.

[0076]This recording operation sets up a value of upper limit capacity (full) of the track buffer memory 7and minimum capacity (empty) in an optical disk unit of drawing 6respectivelyHe is trying to control operation of the optical head 3carrying out a signal compressed by AV coding decoding section 6 per predetermined recordand writing it in 64 M bytes of track buffer memory 7 temporarilyand managing remaining capacity of the track buffer memory 7 concerned. For exampleat the time of record to the optical disc 1an error correction codean addressand a sink signal are added to compressed data of the track buffer memory 7leather power is modulated in a strategy circuit of the amplifier part 4and it records on the optical disc 1 from the optical head 3.

[0077]When continuing the record concerned and capacity of the track buffer memory 7 turns into minimum capacity (empty) here according to a difference of a transfer rate of a record signal to inputand a transfer rate of a record signal recorded on a diskRead-out from the track buffer memory 7 concerned will be stopped temporarilysaid linking to the optical disc 1 will be processedand record will be stopped.

[0078]For this reasonin an optical disk unit of drawing 6a built-in RAM area of the system controller 9 is equipped with an ECC block management domain for managing an ECC block of the linking position concernedfor exampleHe is trying

to record an ECC block address of a linking position by setting a byte corresponding to the linking position concerned to "1" in this ECC block management domain.
[0079]Nextwhen remaining capacity of the track buffer memory 7 is recovered and read-out of data becomes possible from the track buffer memory 7 concernedthe system controller 9processing the aforementioned linking from an ECC block of an address corresponding to a linking position -- a profit -- it is made to make record resume Continuous record is performed by repeating this operation.
[0080]Nextit is as follows when playing the optical disc 1 in which record which was mentioned above is performed. At the time of the playback concerneda management data field on recording management area in the most inner circumference of the optical disc 1 is played firstand the system controller 9 reads a linking byte map in regenerative data of the management data field.
[0081]Namelythe system controller 9 reads an address of the Data Recording Sub-Division starting position of a linking byte mapand recording end position arranged at recording management data (RMD) indicated in recording management areaThe range of a field where record on the optical disc 1 was performed is recognized.
[0082]Nextthe system controller 9 reads a linking byte mapand memorizes and manages this to a linking position control field established in built-in RAM. In the system controller 9a linking byte map memorized to a linking position control field on built-in RAMIt changes into the address position based on an address signal detected through sink detection in the signal processing part 5translated-address position concerned and a current address position are comparedand it is calculated whether an address of an ECC block reproduced next includes linking.
[0083]Herewhen it is predicted that the ECC section reproduced next includes linkingthe system controller 9 is sent to the signal processing part 5 or the amplifier part 4 so that the information may be mentioned later. In the signal processing part 5 or the amplifier part 4if information on the linking concerned is receivedbased on the informationprocessing for interpolation of change of a response characteristic for linking which is mentioned latera change of a windowetc. will be performed. Details of processing for interpolation in the signal processing part 5 concerned are mentioned later.
[0084]In order to process interpolation [change / change of the response characteristic of the ECC section which includes linking in simple in different working example/ of a window]Specify an ECC block to which linking is actually performed on a linking byte map as mentioned aboveand interpolation is not processed about the ECC blockA cheap device can be realized by processing interpolation in timing (it is henceforth called a

linking position) of a position equivalent to a position to which linking of all the ECC blocks is carried out so that it may mention laterwithout needing the linking position control 92 in the system controller 9 mentioned later. In this caseby a disk which completely has the same ECC block structurelike a DVD-ROM format only for playback with reproducing compatibility to DVD-RW. Since overwriting recording is not performed like DVD-RW and there is no linkinginterpolation processing in a position equivalent to a linking position is unnecessary. In such a caseabout a disk only for playbackthe same reproduction performance as usual is maintainable by distinguishing a kind of disk and being made to perform the above interpolation processings only about a recorded type disk [like DVD-R or DVD-RW] whose kind of disk is.

[0085]That isat the time of reproductionin the linking position L concerneda possibility that some data is destroyed is hightherefore there is a place which cannot reproduce those bytes' data at the time of reproduction. From such a backgroundmore reliable reproduction is realized by this embodiment by performing special management which is described below to data (signal) corresponding to a linking position.

[0086]It is performing predetermined processing which is described below to a regenerative signal corresponding to the linking position L as the 1st solution for data of the linking position L concernedand how to realize stable regeneration can be considered.

[0087]That isin the linking position Lsince record is performed intermittentlya signal of a regenerative-signal front corresponding to the linking position L concerned and the back may have changed amplitudefrequencya phase (time timing)asymmetryand quality (jitter etc.). Generating of a byte omission or an unnecessary byte is also considered.

[0088]Soin an optical disk unit of this embodiment. As opposed to a regenerative signal on the time of optical disk reproductionand corresponding to the linking position concernedfor examplethe response characteristic of (1) PLL circuit[change or (for examplespeed of response is gathered)] In the linking position Lfor examplea thing for which PLL is locked in the part section concerned since data may not exist like [in the case of a defect](2) slice level for binary-izing a regenerative RF signal -- change (for exampleinserting a transitional waveform voltage of slice level change) -- orWhat (for examplea frequency characteristic and speed of response are gathered) the response characteristic of a filter (returned type low pass filter) is changed for(3) What the response characteristic of an AGC (automatic gain control) circuit for performing gain control of a regenerative RF signal is switched for (for examplespeed of response is gathered)(4) Since data may not exist like [in the case of a defect] in changing the equalizing characteristic of an equalizer (EQ) for adjusting the frequency characteristic

of a regenerative RF signaland (5) linking positionCarrying out the introduction hold of the driving output of a servo system in the sectionand when a record phase shifts in (6) linking positiona former sink signal is receivedNextsince a sink signal may not go into a window of a sink signal expected to come to the next when coming timing of a sink signal shiftsin timing of the following sink signal. Stable regeneration is realized by processing performing processing which extends a window of a sink signal etc.

[0089]Howeversince performance may get worse when an optical disc which has a fingerprint and a crackfor example is played when it processes raising the above response characteristics to the usual regenerative signal etc.Let predetermined processing of the solution of (1) to (6) be only the section of a signal corresponding to a linking position. Immediately after seeking to the target trackand a change of record reproductionsince composition for performing a change of the above response characteristicsetc. for the same purpose existsthis composition is applicable to an optical disk unit to the regenerative-signal section corresponding to the linking position concernedfor example.

[0090]Important section composition of an optical disk unit of an embodiment of the invention for realizing the solution of (1) to (6) is extracted and shown in drawing 8. In an example of this drawing 8the amplifier part (preamplifier) 4 of drawing 6the signal processing part 5the servo section 8and the system controller 9 are extractedand these internal configurations are shown.

[0091]In this drawing 8a regenerative RF signal from the optical head (PU) 3 is inputted into AGC circuit 41 of the amplifier part 4. In AGC circuit 41 concernedautomatic gain control of the regenerative RF signal from the optical head 3 is carried out to a predetermined signal leveland a regenerative RF signal after the gain control is sent to the equalizer 42. The equalizer 42 raises the frequency characteristic of a regenerative RF signal from AGC circuit 41and sends it to the binarization circuit 43. In this binarization circuit 43a regenerative RF signal from the equalizer 42 is binary-ized with predetermined slice leveland a regenerative signal of the binary concerned is sent to PLL circuit 44. In PLL circuit 44PLL is locked with a regenerative signal of a binary. Thusa regenerative signal of a binary by which the PLL lock was carried out is sent to the signal processing part 5.

[0092]A regenerative signal of a binary inputted into the signal processing part 5 is first sent to the sink detector 51. the sink H shown in above-mentioned drawing 2 (D) contained in a regenerative signal of a binary with this sink detector 51 -- ' -- a clock signal from PLL[count and] Nexta window signal (drawing 11 (b)) of a sink signal is generated in timing of a sink signal which should comeWhen a sink signal which enters into this window

is made into a regular sink signal and the following sink signal does not come to this windowSince the following sink timing may have shifted when a sink signal was generated as an interpolation sink and this sink signal was not acquired twice in successionfor examplea sink window is extended from the conventional valueand it controls so that a sink signal is acquired in the wide range. Since the following sink timing after linking may shift similarly when linking is performed in a linking position of an ECC block so that it may mention laterInformation on an ECC block including linking from the linking position control 92Operation which a linking timing signal is sent to sink detection of 51 by the linking timing generation 54and extends a window of the following sink signal from information from the address detection 52 and information on sink timing is performed (w4 of drawing 11 (b)). In [in different working example92 copies of linking position control cannot be foundand] all the ECC blocksOperation which a linking timing signal is sent to sink detection of 51 by the linking timing generation 54and extends a window of the following sink signal from information from the address detection 52 and information on sink timing is performed (w4 of drawing 11 (b)). Therebystablya sink signal is detected and a timing signal based on the sink concerned is sent to the address detection machine 52 and the linking timing generation machine 54. A regenerative signal through this sink detector 51 is also sent to the address detection machine 52. In the address detection machine 52to timing of the sink concernedan address included in a regenerative signal is decoded and the address is sent to the system controller 9. A regenerative signal through the address detection machine 52 is sent to the data-processing machine 53. In the data-processing machine 53a recovery of an EFM+ signal and decoding to NRZ data are performed to a regenerative signal which is a digital signalerror correction processing is performed furtherand regenerative data is generated.

[0093]The ECC block-address Management Department 91 of the system controller 9An address of an ECC block unit is managed based on an address from the address detection machine 52and data processing of an ECC block unit in the data-processing machine 53 of the signal processing part 5 is controlled by an address of the ECC block unit concerned. The linking position control department 92 of the system controller 9 generates a timing signal corresponding to a linking position in an ECC block based on an address from the address detection machine 52and information about a linking position taken out from a regenerative signal. A timing signal corresponding to a linking position in this ECC block is sent to the linking timing generation machine 54 of the signal processing part 5.

[0094]A timing signal based on a sink supplied from the sink detector 51 in the linking timing generation machine 54A timing signal corresponding to a

linking position in an ECC block supplied from the linking position control department 92 of the system controller 9 generates a linking timing signal as shown in (C) among drawing 9. In different working examplethe ECC block-address Management Department 91 of the system controller 9An address of an ECC block unit is managed based on an address from the address detection machine 52and data processing of an ECC block unit in the data-processing machine 53 of the signal processing part 5 is controlled by an address of the ECC block unit concerned. In the system controller 9it does not have the linking position control department 92but a timing signal corresponding to a linking position in all the ECC blocks is generated from the address detection machine 52. A timing signal corresponding to a linking position in this ECC block is sent to the linking timing generation machine 54 of the signal processing part 5.

[0095]That isthe linking timing generation machine 54 generates "H" and a linking timing signal of the "L" binary which are shown in (C) among drawing 9 for extracting a signal zone corresponding to a linking position as shown in (A) among drawing 9 from a regenerative RF signal shown in (B) among drawing 9. In an example of drawing 9a portion of "L" of a linking timing signal supports a signal zone for extracting a signal zone of a linking position from a regenerative RF signal. This linking timing signal is sent to each switching control circuits 454647and 48 of the amplifier part 4and the hold circuit 81 of the servo circuit 8.

[0096]The linking timing generation machine 54 sends a timing signal corresponding to a linking position to the sink detection 51A clock signal from PLL is counted and a sink window of a sink signal after linking to which it should come for the next is extended from the conventional valueand it controls by the sink detection 51 so that a sink signal is acquired in the wide range. In [in different working example92 copies of linking position control cannot be foundand] all the ECC blocksOperation which a linking timing signal is sent to sink detection of 51 by the linking timing generation 54and extends a window of the following sink signal from information from the address detection 52 and information on sink timing is performed.

[0097]Only when it distinguishes from a recorded type disk by the disk kind discrimination section 100 at this timeit may be made to extend a window in a linking position for it to be so that it may be the above. Namelya device distinguishes a kind of disk at the time of disk insertion. When a kind of disk is DVD-ROM only for playback as a resultsince there is no linkingit controls not to perform control which extends a windowand in recorded type DVD-R or DVD-RWsince a linking position may existcontrol which extends a window is performed.

[0098]The switching control circuit 45 of the amplifier part 4 is a control

circuit which carries out switching control of the response characteristic of AGC circuit 41is the section when a linking timing signal is "L"i.e.a signal zone corresponding to a linking positionand performs control which gathers speed of response of AGC to a regenerative RF signalfor example.
[0099]The switching control circuit 46 of the amplifier part 4 is a control circuit which changes the equalizing characteristic of an equalizeris the section when a linking timing signal is "L"i.e.a signal zone corresponding to a linking positionand performs control which changes an equalizing characteristic to a regenerative RF signal.
[0100]The switching control circuit 47 of the amplifier part 4 is a control circuit which carries out change control of slice level of the binarization circuit 43or the response characteristic of a filterControl which gathers changeor a frequency characteristic and speed of response of a filter for processing which gathers voltage of slice level to a regenerative RF signal or speed of response in the section when a linking timing signal is "L"i.e.a signal zone corresponding to a linking positionis performed.
[0101]The switching control circuit 48 of the amplifier part 4 is a control circuit which carries out change control of the response characteristic of a PLL circuitand a linking timing signal is the section used as "L"i.e.a signal zone corresponding to a linking positionSince speed of response of a PLL circuit is gathered or it is possible that data is confused near the linking positioncontrol that only the section locks PLL is performed.
[0102]The servo section 8 is provided with the focus servo circuit 82the tracking servo circuit 83and the spindle servo circuit 84 at leastand them the hold circuit 81It controls by the section when a linking timing signal is "L" about each driving output of these focus servo circuits 82the tracking servo circuit 83and the spindle servo circuit 84i.e.a signal zone corresponding to a linking positionto output an introduction hold and reference voltage.
[0103]An optical disk unit of an embodiment of the invention is having composition shown in drawing 8and processing of the 3rd solution mentioned above can be realized in a signal zone to a linking position. Switching control in each switching control circuits 454647and 48 of the amplifier part 4performing all the switching control in the section (signal zone corresponding to a linking position) when a linking timing signal is "L" -- orThey may be any of performing one only of any switching control of theyor carrying outcombining some of these switching control accommodative.
[0104]If data other than information on a linking positionfor examplelaser power at the time of recordambient air temperaturea strategy valueetc. will be recorded on a management data field in this embodimentIt becomes possible to be able to expect now a difference of data of linking position before and the backand toset up more appropriately the response characteristic of each item

in the 1st aforementioned solutionetc. as a result.
[0105]Though it is [to] required as time until PLL draws from a linking position of drawing 7 is the 4th sink frame of the worst heresince a linking position is a head position immediately after a sink signal of a row of an ECC blockTime to PLL drawing in can be enough secured in one rowand it has a merit which does not have influence of the following sequence.
[0106]Although this linking position is made into a head position of the 2nd row of a row of an ECC block in this working exampleit may be after the 3rd row and a position just behind important data (CMP) of ID of the 1st rowetc. may be sufficient as it.
[0107]Other examples of processing of optimization in a linking position in the case of reproduction are explained with reference to drawing 11. Since it is recorded as new record data shows drawing 11 (e) after being recordedas pre-record data shows drawing 11 (d) in a linking positionSince recorded data becomes discontinuous in a linking position as shown in drawing 11 (f)in reproductionTiming equivalent to a linking position within an error correction block is generatedbeing based on this timing -- linking position order (for examplea period shown by w in drawing 11 (a)its neighborhoodetc.) -- or -- back (for examplea period shown by w4 in drawing 11 (b)its neighborhoodetc.) -- it is necessary to optimize a reproduced information signal At least one processing in (e) or two or more processings are performed from (a) shown below as control of optimization before and after a linking position (for exampleperiod shown by w in drawing 11 (a)). (a) Slice level for binary-izing the response characteristic of a PLL circuit of a reproduced information signaland the (b) regenerative RF signal(c) Hold the equalizing characteristic of an equalizer (EQ) for adjusting the response characteristic of an AGC (automatic gain control) circuit for performing gain control of a regenerative RF signaland the frequency characteristic of the (d) regenerative RF signaland a driving output of the (e) servo system. [0108]Since an arrival position of a sink shifts after a linking position as shown in drawing 11 (c)processing which controls a window of a sink signal and which specifically expands width of a window like a period shown by w4 in drawing 11 (b)for example is performed.
[0109]The disk kind discrimination section 100 distinguished recording type disks (DVD-RWDVD-Retc.) and playback exclusive discs (DVD-ROM etc.)andin the case of a recording type diskexplained an example for performing optimization processing near a linking positionbut. What a difference in the recording reproduction characteristics of a recording type disketc. are distinguished as other examples in the disk kind discrimination section 100 shown in drawing 10and optimization is controlled for according to a discriminated result of a kind (recording reproduction characteristics) of distinguished recording

mediumFor exampleit is also possible to carry out the nonrandom assortment of the optimization processing of (a) - (e) mentioned above based on a result of disk kind distinctionand to processor to carry out variable setting out of the setting out of width of a window of the window w4 of a sink signal based on a result of disk kind distinction.

[0110]In explanation mentioned abovealthough an example which uses a linking byte map was explainedit is also possible to use a linking bit map.

[0111]

[Effect of the Invention]As explained aboveaccording to this inventionthe specific sink frame in the specific sector of an error correction block. (For examplenear the tip part of the data area in the 2nd sink frame of the 1st sectorand on a concrete target3 bytes from the 1st byte of this data area to the 3rd byte) Or a linking portion (linking position) is set upwithout three of the bytes from the 1st byte of this data area to the 10th byteEven if it carries out the reproducing scan of the above mentioned linking position top when reproducing this recording medium since the recording medium which carried out additional recording of the new information after existing recorded information can be obtained as a resultThis linking position from the existing sink frame concerned after 2 sink-frame lapse of period. Can make good connector reproduction with the additional information which carried out additional recording [which could obtain good regenerative data without frequency or a phase shiftand were existing-recorded / the information and next]and it compares with the further conventional thingThe recording mediumthe record methodthe recorderthe regeneration methodand playback equipment which can reduce by half the quantity of the unreproducible data in a linking position can be provided.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a figure showing the structure of the ECC block in the recorded information recorded on DVD-RW.

[Drawing 2]It is a figure showing the physical format of the recorded information recorded on DVD-RW.

[Drawing 3]It is a figure showing the physical format of one sector.

[Drawing 4]It is a figure showing a physical format including the conventional linking position of one sector.

[Drawing 5]It is a figure showing a physical format including the linking position of one sector in the recording medium of this invention.

[Drawing 6]It is a block diagram showing the outline composition of an optical

disk unit.
[Drawing 7]It is a figure for explaining the relation between the composition of an ECC blockand linking.
[Drawing 8]It is a block diagram showing the composition of the principal part in the case of realizing the 1st solution of an optical disk unit.
[Drawing 9]It is a wave form chart used for explanation of the linking timing signal for extracting the signal zone corresponding to a linking position from a regenerative RF signal.
[Drawing 10]It is a block diagram showing other composition of the principal part in the case of realizing the 1st solution of an optical disk unit.
[Drawing 11]It is a figure for explaining processing in a linking position.
[Description of Notations]
1 -- Optical disc (recording medium)
2 -- Spindle motor
3 -- Optical head
4 -- Amplifier part
5 -- Signal processing part
6 -- AV coding decoding section
7 -- Track buffer memory
8--16-M byte D-RAM
9 -- System controller
10 -- Key input section
11 -- An audioinput/output terminal of a video signal
12 -- Input terminal of control data
13 -- Interface part of ATAPI
100 -- Disk kind discrimination section